



QUARTERLY STATUS REPORT NO. 9

1 April 1967 - 30 June 1967

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by

Lee B. Zink

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P R E F A C E

This Quarterly Status Report covers Center activity from 1 April 1967 through 30 June 1967. The report was prepared by Dr. Lee B. Zink, Director of the Center, with the assistance of the entire staff. It is the ninth quarterly report of activity on NASA contracts since TUSC was founded.

July, 1967

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S U M M A R Y

Work of the Center progressed satisfactorily during the quarter.

Two highlights of activities were the semi-annual TUSC Advisory Board meeting held in April and an inspection visit by NASA officials in June.

TUSC sponsored three meetings during the quarter. One was for scientists at Southwestern State College; one was a general audience meeting at Fort Smith, Arkansas; and one was a meeting of public utilities officials at Fort Smith, Arkansas.

Momentum in the project to serve firms at some distance from the Center is increasing and preliminary indications point to some degree of success. Additional firms will be contacted, soon.

Cooperation with the Oklahoma State Technical Services program continued at a fairly low level of activity.

The updated material for the profile data publications is at the printer.

Technology Utilization Program

During the quarter the technology utilization phase of the TUSC program maintained satisfactory progress. Some nine new clients became active during the quarter. Some 567 technical reports were provided to clients during the period.

The following is a continuation of the reporting procedure for transfers of technology established in Quarterly Status Report Number 2 and continued in subsequent reports. The first section involves the updating of previously reported transfers. The numbers used are those given the transfer when originally reported.

34. The peanut drying project--to relate the knowledge of heat transfer generated in the aerospace industry to the problem of drying peanuts--continues to show significant promise. Nine proposals from some of the giants of the aerospace industry have been made to the Oklahoma Peanut Commission. Resumes of participants in these proposals listed more than thirty universities as having degree personnel involved. Of the persons working on these nine proposals, eight hold Ph.D. degrees, twelve have M.S. and more than thirty hold bachelor degrees. Expert heat transfer scientists and engineers who are involved in aerospace programs were suddenly directing their efforts toward a mundane problem which they had not known existed. The peanut commission expects to let a contract sometime in July to enter the first phase of the project. This will provide the

aerospace industry an opportunity to attack a problem of heat transfer which has plagued agriculture for fifty years.

89. Problem - To find state-of-the-art material on aluminum brazing.

Solution - This company is currently engaged in metal fabricating and welding. They are one of few shops in the area equipped for welding aluminum. There are several methods of welding aluminum, and the method used depends on the type aluminum that is being welded. A search was done in STAR and IAA and also in The Welding Journal from 1964-1966. Many abstracts were found and sent to the client. At this time it is probably too early for the client to have evaluated the abstracts. A report was made from open literature which revealed several practical and simple articles on aluminum brazing.

90. Problem - A client asked TUSC for information on evaluations of motor oils.

Solution - The client has an outside interest with a friend who is in the car business. They have had a lot of trouble with motor oils doing a thorough job of lubricating vital engine parts. They asked TUSC to find pertinent information on motor oil. A search in STAR and IAA was done and several reports were found. The client ordered N65-28624, "Method of Improving the Antiwear Properties of Lubricating Oils," and N66-11082, "Synthesis, Research, and Application of Sulfonate Additives to Lubricating Oils." Both of these reports were on

oils which are intended for use in friction units and mechanisms with additives which would result in lowering of wear in lubricated parts and increase service. The client indicated that they were helpful.

91. Problem - To find solvents to clean metal surfaces.

Solution - This company is developing a high pressure washing system for aircraft. This equipment is much like the automatic car washes except the pressure must be greater to cut heavy grease and oil deposits. A search was done in STAR and IAA and several abstracts were found. N65-11143, "Comparison of Solvents for Cleaning Metal Surfaces," was ordered. This report deals with a solvent testing program that was considered to determine the best solvent for cleaning operations.

There is a major problem in cleaning jet aircraft in that the jet fuel is an oil base and where the exhaust comes in contact with the metal surface, the oil tends to stack up. When the company gets its pressure equipment ready for operation, they have indicated that this report will be valuable in solving the problem.

92. Problem - To find materials to build an electrically-fired incinerator for commercial use.

Solution - A client has invented an electrically-fired garbage and refuse incinerator. At the present time he has a patent pending status on the idea. The company has no engineering capabilities, but they do have the technical capability to build

and test the incinerator. During the first visit from a TUSC Industrial Specialist, a working model was demonstrated and problem areas were identified.

The most prominent problem during the initial construction is in electricity--that is in figuring the correct voltage and finding the proper electrical equipment to be used. The Industrial Specialist called on an electrical engineer from the OSU engineering staff who is a consultant on the TUSC staff. The engineer and Industrial Specialist made a trip to the company to work on the problems that have arisen already. The problems are many and complex, as in any new product.

At the present time, the engineer is working out equipment that could be used and voltage requirements for safe and reliable usage. At the same time, TUSC has initiated and completed five searches for the project that will help solve secondary problems from the NASA literature.

After the electrical problem is solved, construction problems will be encountered. Probably the first area to consider in construction is to find a metal that could withstand the high temperatures and be economical. A manual search was done, and also a search request was sent to ARAC. As a result of the search, many materials were found that would do the job, but as has been found before, the exotic metals are much too expensive and would require special welding equipment and fabrication techniques far too expensive to be feasible. After this was determined, the company thought it would be more practical to use a mild steel vessel with a high temperature liner. A search

was then done on materials for this purpose and many abstracts were found in this field. It is estimated by the inventor that the temperature inside the incinerator could go as high as 4,000^o F. With this figure in mind, the problem of finding electrodes that would withstand this high temperature arose. A search was done on electrodes that would stand up under this type of environment.

After establishing an approximate operating temperature, some special type instrument would have to be found to measure temperatures in the extreme ranges. Another search was done for the purpose of finding this equipment. It was found that NASA had done a lot of work in this area and abstracts were found that dealt with temperatures up to 5,400^o F.

As stated previously, many problems have arisen, and in projects such as this, one problem leads to another. After the basic incinerator is completed, the following will have to be determined by testing:

1. How much pressure will build up inside the container?
2. How much oxygen will be required to burn the waste in 15 minutes.
3. How many electrodes will it take to get 2,800^o F. in a 7' x 8' container?
4. What type of insulators could be used for the electrodes?
5. How can the air vapor that is given off by the burning refuse be filtered?

TUSC has sent 161 abstracts and three special reports concerning the searches mentioned above. The client has ordered twenty-two reports.

93. Problem - To find a better plastic resin to finish furniture.

Solution - This client is having problems finishing furniture with plastic polyester resin. Between coats of plastic, the finish tends to develop small air bubbles which distort the finish of the product. A report from the open literature was compiled on new plastic finishes and causes of poor finishes. The client states the report has been of much benefit.

94. Problem - To obtain knowledge of the state-of-the-art in kiln drying.

Solution - This client designs and constructs commercial furniture from rough oak timber. He starts the process in the woods where he fells the tree and takes it on to a finished product. His present plant does not include a kiln dryer. This type drying, compared with air drying, would speed up his operations considerably. TUSC supplied the client with information and construction plans that he could build himself at a very low cost. TUSC also provided a report on processing raw lumber which was taken from Forest Industries magazine.

95. Problem - To find a better way to join light stainless steel tubing to heavy carbon steel.

Solution - The client asked for state-of-the-art on laser welding. The state-of-the-art has not advanced enough to put this type of welding into production usage.

96. Problem - The client's welding requirements are pushing the state-of-the-art. He is regularly welding thin wall stainless steel tubing to four inch thick carbon steel and needs a better method of welding.

Solution - Explosive welding was examined for a solution to his welding problem. The method is not developed enough for production line usage.

Economic Data and Research Services

Professor Warren's research projects mentioned in Quarterly Status Report No. 8 continue to progress. The analysis of employment changes by counties is to be published in the TUSC Bulletin Series. This work is nearing completion and will go to the printer soon. In Warren's more complex study of the impact of local governmental expenditures on economic development, initial computer runs have been received and are being analyzed.

One of our clients contacted us during the quarter regarding a market analysis for his product. Although this work is a bit out of our line, we were able to easily do some preliminary work which proved useful.

We are currently in process of preparing a TUSC Special Publication which is based upon work done previously by Dr. Zink

while he was employed at Oklahoma State University. The publication of this work follows our philosophy of providing a vehicle for publishing worthy research which relates to the problems of economic development.

General Center Functions

One of the highlights of our activity this quarter was the semi-annual meeting of the TUSC Advisory Board. This was held 21 April 1967 at Lake Texoma Lodge near Durant. Mr. George J. Howick, Director, Technology Utilization Division, NASA, brought news of the national program to the group. During this meeting one of the members of the board suggested a new approach to some of the problems of technology transfer. His idea is to use part of the existing structure within utility companies to effect contact with potential clients. This idea is now being vigorously pursued. At the end of the formal meeting, the group joined the dinner honoring retiring President and Mrs. A. E. Shearer.

Another highlight was a visit to TUSC on 22 June 1967 by Dr. R. L. Leshner, Assistant Administrator for Technology Utilization, NASA; Mayor Harold Sims, Consultant to the Administrator, NASA; and Colonel Lawrence Attwell, Consultant to the Assistant Administrator for Technology Utilization, NASA. Part of the purpose of the visit was to acquaint Mayor Sims with the NASA TU program. A morning briefing by the TUSC Senior Staff

was held for the visitors. At luncheon, a number of TUSC clients joined the group and in the afternoon, the clients and the NASA personnel had a very effective exchange. We were quite pleased to be visited by this group and learned much from the exchange with them.

TUSC sponsored a meeting held 28 June 1967 in Fort Smith, Arkansas for representatives from area utility companies. The purpose of the meeting was to plan the program of cooperation between TUSC and these firms in the interest of serving a broader segment of industry. In this early stage nothing further will be reported; however, prospects for a successful venture appear good.

We continue to make public appearances in behalf of the TU program. Dr. Hibbs, President-elect of Southeastern State College, accompanied Dr. Zink to McAlester for a presentation to the Rotary Club there. Dr. Zink and Mr. Carpenter spoke to an area meeting of the Associated Industries of Oklahoma in Seminole.

Newsletter No. 9 was published in June and mailed to more than 1,000 persons.

TUSC Staff

Effective 1 July 1967, Dr. A. E. Shearer, President of Southeastern State College and TUSC Chairman will retire. His successor in both positions is Dr. Leon Hibbs.

Effective 20 June 1967, Professor Harold Warren was named Assistant Director of the Center. Professor Warren will continue as Regional Economist while filling this new position in an "acting" capacity.

Specific Report Relating to Statement of Work in NSR 37-004-006

The following is a report relating directly to specific projects stated in the work statement of NSR 37-004-006. Numbers used below are those used in the contract.

1. All previous sections of this Quarterly Status Report relate to this work statement.

2. There is no change with regard to the McAlester meeting as reported in Quarterly Status Report No. 8. The results of that meeting, designed as it was, were disappointing.

The Ardmore meeting has been more encouraging. From the 42 people attending, TUSC gained 5 new active clients who have, to date, submitted 6 search requests. At present, we are on the threshold of one of our most exciting transfers to a firm who became a client as the result of this meeting. If this comes to fruition, all of TUSC efforts in the "meeting field" will have been justified, at least in so far as the TUSC staff is concerned.

A meeting in Fort Smith, Arkansas (directly adjacent to the 17 county area) was held on 21 June 1967. This meeting was jointly sponsored by the Fort Smith Chamber of Commerce and

TUSC. Some 175 invitations were extended to firms in that area. Thirteen persons attended representing 7 industries.

Obviously, we were disappointed in the attendance. A well-planned meeting had been prepared, and, at the request of the Chamber of Commerce, we had obtained a nationally known luncheon speaker to assist in attracting a crowd. Mr. George J. Howick, Director, Technology Utilization Division, NASA, made a very well-received luncheon talk.

It is too early to assess the value of this meeting. One would be tempted to indicate that the poor response indicates that this kind of endeavor is not worthwhile. However, without more time and a more detailed analysis, such a statement is premature.

3. Our relationship with both Southwestern State College and Oklahoma State University under the Oklahoma State Technical Services program continues somewhat slowly. The state field staff for this program is currently being assembled, so activity may accelerate in the future. We have provided specific information on three occasions to the field representative at Southwestern State College. Additionally, a joint seminar to be held in September is currently in the planning stages.

4. After some 60 days of waiting to find out why no hard copy had been requested after 7 searches and 229 abstracts, the Director decided to send an Industrial Specialist to Tulsa. The main finding was this--the personal contact brought attention to

the abstracts laying on desks, which, in turn, brought requests for hard copy. Prospects appear brighter now for some fairly significant transfers to come out of this effort. However, as we know from experience, identification is not always easy and is sometimes impossible.

As mentioned previously, we plan to expand this effort to another city. We had been planning to work through the Chamber of Commerce there, but an apparent lack of interest dictates another course of action. We have not, as yet, fully decided upon that course.

5. Our progress in establishing relations with a large firm is not good. We decided after our first unsuccessful attempt to take a more "scientific and planned" approach in the second venture. We felt that working through one of our most active Advisory Board members should assist in opening the right doors. However, although the assistance was well-meant and wholehearted, the potential client responded as though we were attempting to sell some undesirable soap. We are now pursuing, with this same client, a "through the front door" approach and hope it is more effective.

It appears that our most tangible result in this area to date is a good knowledge of how not to proceed.

6. This statement actually bears close relation to statement 3. We continue to provide these services, particularly with the staff member who works at Southeastern State College on the STS program. He is using the TUSC file to develop

information packages to send to selected small industries in the peripheral area of the 17 county region.

7. Most significant in our efforts to provide information services to faculty research personnel was a meeting held 15 June 1967 at Southwestern State College, Weatherford. The meeting was attended by approximately 20 scientists from all disciplines involved in research at the college. Approximately 80 percent of those attending held Ph.D. degrees. The TUSC staff explained what was available to them and they displayed enthusiasm with the prospect of using this information. It is too early to know whether that enthusiasm will evoke tangible results.

A physicist at Southeastern State College has been utilizing our services extensively during this period. He browsed through our files to find information to enrich one of his courses and was very pleased. Further, he has avoided duplication of research in some of his own work by first checking TUSC information on the subject.

8. The major portion of the updating is now at the printers and will be published and distributed during the next quarter.

9. Activity in this area subsided during the period. Six NASA Technical Notes were obtained for the OSU personnel and three microfiche were loaned them for copying.

10. During the period we provided no direct service to the college aviation program.

11. The Kiamichi Economic Development District of Oklahoma (KEDDO) requested technical information regarding coal derivatives. A large coal field is again being opened in the Kiamichi area and much potential is evident, particularly regarding pending water transportation.

We continue to provide economic data and research support to both KEDDO and the Southern Oklahoma Development Association, as requested.